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E-business in Service Industries: Usage patterns and service gaps

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1 Introduction

The handling of internal and external business procedures in electronic networks (short: e-business[2]) has provided opportunities for process and product innovation in all industries. These opportunities have been taken up by firms in different industries with varying intensity (see E-biz Market Watch 2002). The present paper will examine usage patterns and impacts of e-business in selected *service industries*. Particular attention will be paid to the heterogeneity within the service sector and to country differences.

Service industries have long been regarded as industries with little scope for the use of technical systems, poor productivity improvements over time and a mainly local orientation (see, for example, Miles 1996 and Miles and Boden 2000). This has changed dramatically with the introduction of information and communication technologies (ICT) and the new options available in globally oriented electronic networks (Barras 1986, Miles and Boden 2000). Many services show a high information intensity, and hence, tools that facilitate the proceeding and diffusion of information are likely to have an impact on the way services are generated and delivered (Miles 1993). Especially the options arising from internet-based e-business models may be used by service firms to streamline procedures or to develop new innovative offers. Services that have a high information content and those which assist other firms in realising networked systems benefit from the diffusion of information technology and are drivers of technical change in their own business as well as in that of their customers (Preissl 1998). Indeed, computer services show the highest share of innovators of all business services in Germany (Czarnitzki/Spielkamp 2003).

However, it can be assumed that due to fundamental differences in the nature of services provided, not all services can benefit to the same extent from electronic systems. Furthermore, the use of e-business may differ between service sectors in different countries because of differences in business climate or market dynamics (Preissl 1998). The impact of

[1] The author would like to thank Andreas Gildner and Philipp Köllinger for useful comments.

[2] E-business is used in this paper as comprising external electronic links, i.e., e-commerce relationships with suppliers, business partners and customers as well as the use of integrated networked systems in a company's internal procedures.

e-business on service activities and eventually on performance and market constellations will depend on the type of services considered and the drivers of market development. It can be assumed that services that have used information technology intensively over the last decade will also be intensive users and/or forerunners in the adoption of e-business.

The empirical data presented here have been derived from a company survey which has been conducted in eight service sectors across the EU. From these eight sectors four sectors have been chosen for the present analysis. The criterion for selection was comparability with respect to market orientation, regulation intensity and performance indicators. The dynamics of growth of the service industries analysed here varies between countries (E-biz Market Watch Group 2002, see also Preissl 2000). Country comparisons allow to observe specific specialisation patterns and possible deficits: Complete data sets are available for France, Germany, Italy and the UK.

It will be particularly interesting to have a closer look at the situation in Germany, since this country is generally considered a 'service laggard' (see summaries of the debate in Cornetz/Schäfer 1999 and in Stille, Preissl, Schupp 2003). On the basis of the empirical material on e-business available from the survey, it will be possible to check, if the often stated lack of service sector dynamics (see, for example, Bullinger 1997) also holds for the introduction of innovative technology-based business models in service firms. If service sectors in Germany, compared with their main competitors in Europe are reluctant to introduce e-business, the service gap gains another dimension. The gap is usually identified in oversimplifying terms of shares of services in total employment and value added in a country compared with other countries. It has been pointed out that these indicators are not relevant to estimate the structural 'soundness' of an economy (Stille, Preissl, Schupp 2003) which rather rests on the systemic context that makes a particular mix of industries successful. However, undoubtedly, the performance of services that provide essential inputs in many processes of production and efficient services to private households plays an important role in generating a modern services-manufacturing mix.

This leads to two central research questions which will be discussed in this paper: (1) how is the heterogeneity of services reflected in their use of ICT and e-business adoptions across Europe? and (2) do German service industries differ from other European countries with respect to the use of e-business opportunities?

2 Information technology and e-business in service industries

2.1 E-business related changes in service provision and service markets

E-business refers to the handling of business procedures in networked digital systems. The codification and documentation of activities in digital form and the use of electronic networks to manage flows of information mark the essential changes that lead to a new way of providing services. Information technology is a tool that enables companies to realise business models and production schemes that have been summarised as e-business. One of the most influential implications of e-business is that it changes the way services are generated and delivered to the customer. Existing services can, thus, be provided more efficiently, and entirely new types of services are developed (see also Licht and Moch 1997).

Services traditionally made little use of technology. The introduction of ICT, however, has substantially increased investment in technology and made services more capital intensive (see National Research Council 1993). The implementation of e-business solutions requires investment in quite sophisticated information technology, in skills and in the maintenance of technical systems. In order to be able to make these investments, service firms do not only need a sufficient capital basis, but they must also be prepared 'to think in network terms', i.e., to accept the rationale of technology and network-based service provision. One consequence of this enlargement of competencies is that a new set of qualifications is required in service firms, in particular, technological skills, which enable personnel to operate electronic networks.

Electronically supported processes of service provision change basic characteristics of service *delivery*. With tighter control of information flows and standardisation of communication patterns, craft-like processes are turned into mass-production and can easily be controlled and improved by introducing the strict logic of digital systems into organisational procedures. Automated processes of production require standardised inputs and produce standardised outputs. As a result, economies of scale are no longer alien to services.

E-business does not only change service provision in the supplier companies, it also affects the typical features of *service markets*. Enhanced possibilities of control and integration, greater flexibility with respect to location, as well as the need to handle huge amounts of information flexibly, have facilitated and supported the deregulation and privatisation of service industries. Economies of scale and improved management of large units tend to lead to concentration processes and to an expansion of markets beyond regional boundaries (Preissl 2001). Small scale, family-run businesses are no longer the characteristic type of service firm in an e-business scenario. A common argument that explains the poor innovation dynamics of service firms is that many service firms are small enterprises with little investment potential and

little scope for mass production technology (see Hepworth/Ryan 2000). Gobalised service markets are no longer characterised by small scale service operations, but by impressive merger activity and new co-ordination modes between small units, such as franchising. This is also an economically rational result of the newly emerged economies of scale in providing services.

In an economy based on ICT, some services take the form of information and can be stored, transported and consumed without the personal presence of the supplier. Many services mainly consist of the provision of information in different forms (see also Baumol 1986 on the implications of this phenomenon). This implies that information can be consumed or used many times without visible signs of consumption. Thus, one process of production potentially results in a large number of identical products that can be individually shaped according to a customer's needs with relatively little additional effort. This raises problems of property rights and exclusion, but also offers potential for productivity gains. Thus, in e-business models highly customised services can be delivered at relatively low cost. Individualisation of service is, thus, one feature of electronically supported services. On the other hand, the tools made available by ICT enhance the standardisation and automation of many service activities and make them more similar to mass production goods. The combination of these two tendencies leads to a wider range of options for the shaping of service quality.

The possibility of storing services in the form of information removes the constraint of time in the provision of these services. They can be delivered via electronic networks without the physical movement of either supplier or client. As a consequence, a global reorganisation of service companies has been expected (see Bressand 1986; Daniels 1993).

E-business is the most conspicuous realisation of a new customer interface in services. Personal encounters are substituted by virtual presence, and automated procedures; search engines and self-service information provision directly show the new quality of service provider-client interaction. Theoretically, time and location constraints have become insignificant. In most e-business models for services, the consumers' participation in the design and the delivery of the service is quite intense (see Klein/Totz 2003). The use of computer terminals for information services, where the customer provides the service in interaction with a machine, is a prominent example for this.

One has to bear in mind, however, that the service sector is heterogeneous. The possibilities to use electronic networks to change customer-supplier-interfaces and to streamline internal procedures varies from industry to industry. Therefore, also the impact of e-business on competitiveness and market structures will vary considerably between sectors (see E-biz Market Watch Group 2003).

E-business offers a set of options to companies. Whether its potential will be exploited, depends on the companies' policies and their organisational, technological and financial abilities. The quantitative dimension of the changes that e-business can induce in the service sector varies from industry to industry, and from country to country. It depends on[3]:

- the configuration of the services sector in each country
- driving forces - other than technology - operating in the specific industry (such as regulation, shifts in demand, organisational innovation).
- access to essential equipment and infrastructures
- the speed of diffusion of the technology
- organisational and strategic adjustments in companies and markets.

Given the heterogeneity of services, it is not surprising that network-based adoptions are not used to the same extent in all service industries (see also Baumol 1986). If the internet and its use in supporting business is the basis for eminently important changes in the economy, those sectors that have a higher *absorption capacity* for information technology will show more dynamic changes than others (see, for example, Ducatel 2000). In some industries the nature of the service, the configuration of customer groups and suppliers will make buying and selling online a more natural solution than in others. It will be shown below that the drivers of e-business adoption and their varying relevance in a heterogeneous service sector leads to industry-specific and to country-specific implementation patterns.

2.2 A typology based on information and its role in services

Earlier case study research has lead to the conception of a scheme of four service categories with respect to the use of ICT (Preissl 1995). The criteria adopted here were *information content* in input and output of a service and the *use of ICT* either in core or in peripheral function of a service activity. The scheme presented in Figure 1(next page) has emerged from this research:

The question whether a service lends itself to the adoption of e-business follows similar criteria; however, the external – or e-commerce part of e-business requires to consider additional criteria. Here, the possibility of digitisation and codification of a service might be a central

[3] Detailed analyses of the specific features driving each service sector , in particular with respect to the diffusion and use of e-business can be found n the sector reports compiled for the E-business Market Watch Project. See http://www.ebusiness-watch.org/marketwatch/.

factor. This can be illustrated by the example of a piano teacher. She proceeds a lot of information about playing techniques and sound; however, most of this information cannot easily be codified and digitised. Providing piano lessons over electronic networks, thus, seems illusory. Firemen do not have any significant share of information in their inputs and outputs (apart from knowledge accumulated in education and training), but they might use ICT intensively to co-ordinate their assignments. This intensive use of ICT, however, does not imply that their service can be provided electronically. These examples lead to a criterion that includes information-content indicators and technological elements, as well as elements of the frequency and type of use of ICT. Only those services that consist of information, can be completely digitised and provided via electronic networks, such as consulting or information services. However, for other services important parts of the transaction can be organised online. Going back to the fire department: remote control systems can initiate an offline service, and firemen can inform about their services (which usually go beyond extinguishing fires), collect funds and provide information about preventing fires and other accidents online. Hence, the relevant question is not whether services can be delivered online at all, but which part of the activity can be digitised and sold electronically.

Figure 1

Category 1 Services that hardly use IT
hairdresser, piano or ballet teacher

Category 2 Services that use IT in administrative (support) functions
restaurants, legal advice, repair services, retailing, fireworkers

Category 3 Services that use IT in core functions
consultancy, financial services, business services

Category 4 Services that deal with IT as their core activity
IT consultancy, multimedia services, communication services

In this paper survey data will be used to construct combined indicators for e-business readiness, e-business usage and e-business impact. Apart from differences between services and countries, the indicator approach allows to observe interesting relations between readiness, usage and impact indicators.

3 The survey

As mentioned above, the data used here are taken from a survey which has been conducted in the context of a research project financed by the European Commission (DG Enterprise)[4]. Project partners are empirica, Bonn (project leader), Databank Consulting, Milan, Berlecon Research, Berlin and the German Institute for Economic Research (DIW), Berlin. The European ICT & e-Business Market Watch ("*e-Business W@tch*") monitors and assesses the maturity of e-business in 15 industry sectors across EU Member States, including eight service sectors[5]. All sectors have been covered in 4 countries, France, Germany, Italy and the UK. For each sector the sample size was 100 (or slightly above) in each country. A synopsis of the sectoral studies and a public use data file can be accessed on the project's home page (http://www.ebusiness-watch.org/marketwatch/). Telephone interviews have been conducted with 'decision makers' in the target firms. A wide range of readiness, usage and impact indicators have been covered. However, the range of possible subjects to be included and the level of detail to be reached were clearly limited by time and budget constraints.

4 Sector characteristics

Four service industries have been chosen for the present analysis: Business services (NACE 74), ICT services (NACE 64 and 72), retailing (mainly NACE 52.11, 52.12, 52.4) and real estate (NACE 70). These services are all market-oriented, and have shown a dynamic path of development in almost all countries over the last ten years. A short description of sectors will give some background information for the survey results presented later.

4.1 Business services[6]

The industries included in this sector cover a wide range of activities with different characteristics. Therefore, some authors have preferred to single out a more homogeneous category, knowledge-intensive business services, which comprises consultancy and accounting services as well as advertising and engineering services (see, for example, Miles et

[4] See http://www.ebusiness-watch.org/marketwatch/
[5] The service sectors covered are: Business Services, Credit Institutions, Health, Insurance, Real Estate, Retailing, Telecommunication and Computer-related Services and Tourism.
[6] For a detailed analysis see the sector report: Berlecon Research 2002a.

al. 1994). However, in the data set used here, this is not possible, and – apart from the knowledge-intensive services mentioned above - the data set includes industries, such as industrial cleaning, investigation and security activities as well as a relatively large category of 'miscellaneous business services n.e.c.'. Nevertheless, it is safe to say that the sector as a whole is quite information-intensive, since about two-thirds of its value added at factor cost are created in sub-sectors with high information shares in input and output.

The business services sector has been one of the most dynamic sectors in the EU with respect to growth of output and employment. Despite this generally optimistic picture, some drawbacks have affected the industries in the recent past. The slowdown of economic activity in most industrialised countries has led to a slump in the business services sector, because many firms cannot afford these services any more or have postponed new projects (see Berlecon 2002a). The end of the boom of the 'New Economy' has further calmed down activities in the sector, since fewer new companies that might need advice for the set-up of their business, are founded, and fewer companies are in an expansion phase. Furthermore, there are a series of challenges for business service providers which emphasise the need to activate efficiency potentials and to find ever new solutions for operative and marketing questions.

Most business services require highly qualified staff which implies relatively high costs and – in some areas – intense competition for experts and substantial search costs. On the other hand, costs can be reduced by referring to the internet for the investigative parts of service provision. Firms can use e-business to access information as an essential input more efficiently than before, they can use internal data management to automate search and conception procedures, and, thus, to standardise services. On the other hand, clients expect individual attention and personal responses to their consulting or information problems. Thus, business services seem an ideal field to realise a new mix of automated service support and individual service provision.

4.2 Information and telecommunication services[7]

In the data set this sector comprises two equally large industries. However, the services offered and the conditions under which they are provided differ substantially. While telecommunication services rely on capital-intensive network infrastructures, computer services are characterised by a high labour intensity. Despite market liberalisation

[7] For a detailed analysis see the sector report: Berlecon Research 2002b.

telecommunication markets are still dominated by very large firms, whereas the typical computer service provider is a small firm with a handful of specialised experts. Telecommunication services are mass-consumption services delivered on a continuous basis, computer services are usually project based and individual. However, there are also considerable differences within the computer services sector, depending on the main products. For example, a standard software provider will be faced with markets that come close to mass markets, whereas bespoke software provision is targeted at individual customers (see Berlecon 2002b for a detailed analysis). The handling of the resulting service processes can be facilitated by e-business in both cases, however, the features used will be different. Addressing a mass customer market in an e-business model will require different features form advertising individual software services, both activities require their own back-office support. In any case, the intense usage of technology, the fact that information technology itself is the rationale for existence for these service, makes them most likely to be very intense e-business adopters. However, as we will see, there is still variation with respect to certain features and with respect to the countries the firms are operating in. Information and knowledge play a larger role in computer services, technology, which, albeit, is based on a high level of specialised expert knowledge, is at the core of telecommunication services.

4.3 Retailing[8]

Information and communication technologies have been a key driver in the dynamics of the retail industry for some time. The emergence of *internet applications* offers yet more opportunities to streamline logistics and to develop new marketing and sales channels.

On the procurement side transaction costs and input prices can be reduced through facilitated communication, higher market transparency and easy access to new sources of supply. On the sales side, marketing and administrative costs might become lower, and new customer groups and markets can be accessed with less difficulty than before. Success stories of prominent online retailers that showed impressive turnover growth in their first periods of operation, have created high expectations regarding the potential of e-commerce to push growth and efficiency in retailing.

From the beginning, however, critical voices emphasised the fact that high turnover in E-commerce did not imply high profits, and only very few online-only retailers did not make losses from their operations (see, for example, Margherio et. al 1998). In the meantime, the excitement has calmed down, and a more sober analysis of the actual potential of e-commerce

takes place. The pure online merchants are not at the centre of attention any more, since e-commerce applications in traditional retailing, where specific synergies between physical and virtual presence can emerge (Steinfield / Whitten 1999) seem to influence the sector's overall performance to a much greater extent.

The impact of electronic business on retail markets depends to a large extent on the diffusion of internet applications. This is due to critical mass phenomena and to network externalities: only if a certain number of market participants exists, internet offers become profitable for suppliers; beyond this critical number of actors, a dynamic path of expansion can be expected. The more buyers and sellers meet online, the more valuable participation in electronic markets becomes (Katz and Shapiro 1985, Preissl 1995a). Furthermore, transaction costs can only be significantly reduced, if the costs of establishing online presence and operations can be distributed over a large number of transactions. Costs savings in online (compared with offline) transactions only have a significant impact on the overall cost situation, if a large share of transactions is conducted online.

4.4 Real Estate[9]

About 1.7 million people have been working in the Real Estate sector in the EU in the year 2000. Most companies are rather small with between one and ten employees. Markets show a long-term growth trend, however, they are also vulnerable to cyclical movement. The sector is affected by economic and social phenomena of high importance, such as housing prices, urbanisation, housing standards, affordability and capital markets. High prices for accommodation, like, for example, in London or Munich, imply high revenues for real estate agents, but can also lead a reduced number of transactions. On the other hand, a market with low prices, like, for example, in Berlin, is a sign for a lack of demand which implies increased efforts for real estate agents to create turnover.

ICT and e-business have changed the real estate business significantly, because, as in any brokerage activity, information and market transparency play a key role. Whereas the use of computers to keep track of offers and customer profiles has a long tradition in supporting service provision, e-business via the internet adds a new tool that affects the key competence of bringing together supply and demand in the housing market. The standard tools for advertising property, newspaper ads or displays in the agents' premises refer to traditional media with a limited extension. With the introduction of the internet, transparency could be

[8] For a detailed analysis see the sector report: Databank Consulting 2002.
[9] For a detailed analysis see the sector report: empirica 2002:

considerably enhanced. The amount of information on each object that could be communicated increased by introducing new features, such as photographs of the property, floor plans, and differentiated search tools and price comparison functions. Links to related services offer an additional advantage for customers. Other than local newspapers or shops, the internet offers remote access to housing information. This is particularly interesting for customers who want to move to a distant location. The internet therefore is an ideal instrument to increase market transparency. However, as in any other market, only part of the offers available will occur in the internet which therefore can only create an illusion of comprehensiveness. In addition, customers tend to search only the most popular sites, which again limits transparency. From the agents' point-of-view there is a danger of being by-passed, because the internet enables everybody to launch an offer and contact interested parties without an agent's intervention. However, this risk does not seem to be much higher than in traditional newspaper ads, where private persons can search for objects or buyers or lessees without an agent's intervention.

Although, the internet, thus, seems to be an ideal medium for real estate business, the fulfilment of a contract usually also involves personal contact, since the customer wants to examine the object he/she is interested in buying or renting. Hence, pure online transactions are limited to a small market segment; they occur, for example, for holiday homes. E-business, i.e., the search for customers through ads in specialised portals, will be limited to mass market segments, whereas large objects, such as office buildings or other business estates will remain in the traditional domain and will be based on personal contact.

4.5.1 Service sectors and their expected e-business affinity

Table 4.1 interprets the information on sector characteristics given above in terms of the likelihood of an intense use of e-business. The criteria used to evaluate e-business affinity are: information intensity of the service, customer interface, main customer groups, market form and competition, functions in which ICT is mainly used, electronic tradability or digitisation. If the characteristics pointed out in the table are translated into the scheme introduced in the previous chapter, the following categorisation emerges[10]:

[10] Due to considerable internal heterogeneity in the four service sectors, statements can either only be made for the largest sub-sectors or 'most of the activities included in the sector', or they have to be differentiated according to the relevant sub-groups.

Table 4.1 E-business affinity in service sectors

	Business services	ICT services	Retailing	Real Estate
information intensity	high for most sub-sectors low codification	high in computer services, low in telecommunication	medium high codification	high high codification
customer interface	mostly personal, individualised	individual in computer services, standardised in tlc	mostly personal, automated in mail order shopping	automated in contact phase personal in transaction phase
customer groups	business companies, high degree of network usage	mostly business in computer services business and households in tlc	mostly households; high as well as low network penetration	business and households; from very high to very low network usage
markets	competitive, individualised	competitive; individualised in computer, mass market in tlc	mass markets	mass markets, individual in high-end segments
ICT use	intense in service conception and preparation; low in service provision	very intense in all segments	in support functions, high in large chains, low in small ones	high in data processing and launching of offers; split between auxiliary and core functions
digitisation	varies between sub-sectors; information inputs digitised, consulting outputs not	yes	part of logistics functions; information goods	product information

Business Services

Services are mostly information-intensive. E-business is used in the procurement of knowledge inputs and in some standardised information services, where the service is provided online, such as subscription updates of legal comments or financial information. E-business is, thus, used in support a well as in core functions of a large part of the services in the sector.

ICT services

The sector comprises two very different sub-sectors, computer services and telecommunication. Whereas telecommunication services are technology-intensive, computer services are information-intensive. Despite the intensive use, generation and enhancement of information and communication technology, only selected services in the sector are suitable for online trade, such as software updates, special network related services of internet service providers, sale of standard software, online maintenance and repair services for hardware.

Retailing

E-commerce has been a top issue for retailers in the early days when dramatic growth rates made us believe that in the future online shopping would become a dominant sales channel. Practically, in large parts of the retailing market, going online means to effect information and ordering functions over a networked computer, whereas the actual delivery of merchandise is done via physical transport of tangible objects. Only the relatively small segment of digitisable goods, such as software, electronic books, music and information have been completely transferred to the web. Retail activities have a high e-business potential, however, they meet the same barriers as traditional mail order services: customers want to touch the goods; there are problems of high rates of returns, and the inability of small suppliers to serve mass markets prevents the theoretically possible 'global expansion'.

Real estate

The real estate business is another example where parts of the service delivery process lend themselves to be conducted online. Information provision and information search gain from the vast amount of potential clients accessible via the internet and the good technical prerequisites for the presentation of real estate objects. The contact phase, thus, is an ideal field for e-business adoptions, central portals and marketplaces. Agents use local portals to save costs for newspaper advertisements and to be able to address potential clients in a selective way providing as much information on the object to be sold / rented as possible. The presentation phase usually involves human communication and interaction, whereas the completion phase (contract negotiations, credit information, settlement between buyer and seller) relies heavily on ICT; this ICT, however, supports individual communication, hence it could be a simple e-mail connection or even a telephone line. Usually, in this third phase, the internet is not used any more.

We would therefore expect to find ICT services in the group of very intensive ICT and e-business users (category 4 in the typology presented in chapter 2: services that deal with ICT as their core activity), business services and real estate services in a group of intensive users, but with less complete business models (category 3: services that use ICT in core functions)[11]. In business services this 'medium e-business affinity' is due to the inner heterogeneity of this sector and to the fact that some services cannot be easily digitised; in

[11] Unfortunately, we cannot analyse the completeness of business models with the data used here. However, indicators based on diffusion data and impact of e-business in total business can give an approximation.

real estate it reflects the different phases of service delivery. Retailing, finally, can be expected to belong to a group of not-intensive users (category 2: services that use ICT in support functions), since adoptions tend to affect only a small range of turnover and a small peripheral part of the usual business procedures.

5 Research results

5.1 The indicator system

A combined 'readiness indicator'

The variables used to represent the readiness of companies to engage in e-business are rather simple ICT diffusion indicators (see also empirica 2002). The indicator is composed of the percentage of companies in the survey that use these features (see Table 1). Weighting factors are normalised to generate a maximum indicator value of 100. They take into consideration the degree of advancement towards the realisation of e-business systems: whereas a computer is a necessary condition, but useless for e-business, if not connected to a network, internet access and a company website already prepare e-business solutions.

E-business readiness indicator

Variable	***Weighting factors***
computer usage	0.10
internet access	0.25
e-mail	0.20
company website	0.30
intranet	0.15

Computer usage, internet access and a company website are direct prerequisites for E-commerce. E-mail and the existence of an intranet in a company indicate e-business readiness and are a sign of a generally favourable attitude towards advanced communication systems.

All three indicators (readiness, usage, impact) are constructed according to the same procedure. They consist of the weighted sum of the shares of companies that adopt the listed features:

$$I = \text{sum}\ (\%\text{computer}*a_1 + \%\text{internet}*a_2 + \%\text{e-mail}*a_3 + \%\text{web-site}*a_4 + \%\text{intranet}*a_5)$$

Indicators are, thus available for e-business readiness in each sector and in each country. They can again be summed up across countries to indicate performance in all service sectors or across sectors to indicate country performance (see Preissl 1998a).

A combined 'usage indicator'

The indicators for usage have been constructed in an analogous way. The variables used here refer to the actual realisation of e-procurement or e-sales:

The indicator concentrates on basic e-commerce related variables. The sophistication of e-commerce solutions adopted by companies could be expressed using additional variables, such as the participation in electronic market places or online after-sales customer service.

E-commerce usage indicator

Indicator	*Weighting factors*
selling online	0.33
online sales volume	0.22
procuring online	0.25
online procurement volume	0.20

However, the more complex the indictor is, the more variation disappears in the process of aggregation. It might, thus, not be wise to blur results with too many variables that make it difficult to interpret the resulting indicator value.

Since it is not only important *that* a company uses electronic sales and procurement channels, but also *how much* of its turnover and purchases are already processed online, the survey asks to give the share of online sales and online procurement volumes in total sales and purchases. The indicator comprises those companies, where the e-commerce share is over 25% of total transaction volumes.

The e-business part that refers to internal procedures is being represented by the variables in the scheme below. Weighting factors have been chosen to express the possible impact on the overall efficiency of business procedures in a company. It can be assumed that sharing documents which allows to perform collaborative work online, implies a much more profound change of working routines than the online organisation of travel reimbursements. The tracking of working hours and production time electronically supports efforts to increase

the efficiency of service provision[12] and will have a deeper impact than the handling of travel expenses through internal networks. Whether the introduction of e-learning affects the performance of the company as a whole, depends on the frequency of learning activities and the participation rates of employees in (online and offline) courses in a particular company, and this, in turn, depends on the nature of the service activity.

Internal e-business usage indicator

Indicator	*Weighting factors*
share documents	0.26
automate the handling of travel expenses	0.11
track working hours of employees	0.23
human resource management	0.23
e-learning schemes	0.17

The two sub-indicators for e-business usage, the e-commerce indicator and the internal e-business usage indicator, can again be aggregated to form a combined e-business indicator.

A combined 'impact indicator'

Impact indicators are not as solid as other indicators, because the data base is rather small. Only companies that actually do engage in e-business have been asked impact questions. Therefore, in some service sectors and some countries, the number of valid answers was between 3 and 10. Since fewer companies engage in online sales than in online procurement, the data base was extremely limited for questions concerning the impact of online sales. It has, thus, been decided to construct the impact indicator exclusively on the basis of companies' experience with electronic procurement and its impact on supplier relations and on business procedures in the company.

The impact indicator consists of four variables, of which two refer to external e-business applications, two on internal business procedures. Weighting factors are 0.25 for each variable.

[12] It should be borne in mind, however, that these systems can also cause substantial implementation and management costs, and a loss in informal communication due to strict time control. Recorded time savings can, thus be only fictitious or lead o a loss in motivation and quality of service.

Impact of online procurement

Indicator	*Weighting factors*
costs of logistics and inventory	0.25
procurement costs	0.25
relations to suppliers	0.25
efficiency of internal business procedures	0.25

5.1 Survey results

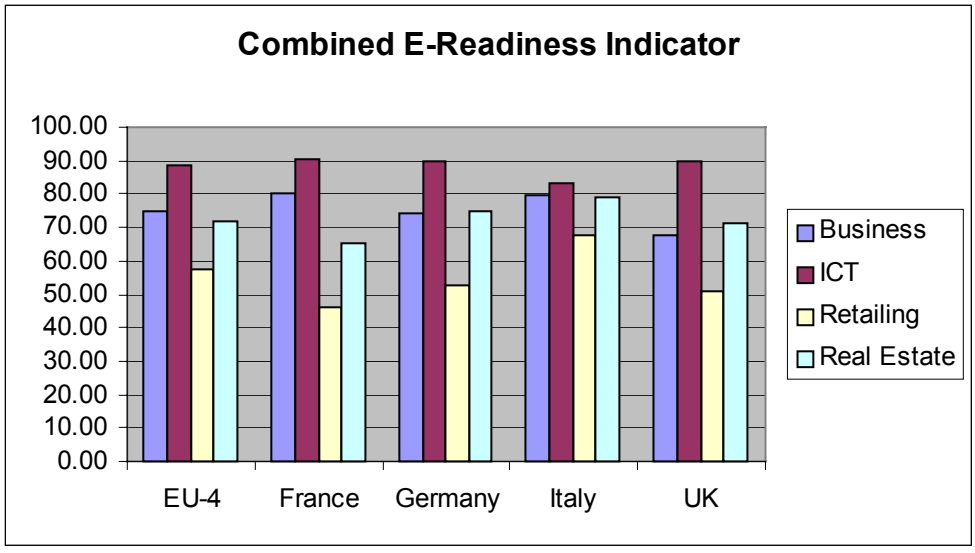
5.2.1 The readiness indicator

Table 5.1 and figure 5.1 show the values for the combined readiness indicators.

Table 5.1 E-business Readiness Indicator

	Business	ICT	Retailing	Real Estate
EU-4	74.72	88.52	57.20	71.78
France	80.29	90.59	45.98	65.41
Germany	74.04	89.53	52.98	74.79
Italy	79.38	83.28	67.88	78.90
UK	67.48	90.04	50.71	71.37

Figure 5.1



As expected, in all countries the ICT sector shows the most advanced diffusion of network related equipment, and retailing ranks last. Business services and real estate firms use networked technologies, however, since the technology itself is not part of the core business, diffusion happens more slowly than in ICT services.

When considering the indicators by country, none is ahead of the others in all sectors, but rankings change from sector to sector. Whereas French business service firms and ICT service providers have higher readiness indicators than those in other countries, Italian firms are most active in retailing and in real estate services. German firms have a considerably higher readiness indicator than UK firms in business services, retailing and real estate, but remain slightly behind the UK in the ICT sector. Taking all sectors together, quite surprisingly, service companies in Italy have a higher e-readiness than those in the other countries; this is due to an exceptionally high indicator for the retailing sector. German firms are positioned around the European average. The UK and France only differ negligibly, with France slightly in front.

Whereas in retailing and in real estate activities are reasonably homogeneous, in ICT and business services very different activities are being pursued. Hence, differences between countries can be due to the composition of services within the sector[13]. A large share of knowledge-intensive or technology oriented industries in the business services sector, for example, will result in a more wide-spread use of information and communication technology than in countries with a high share of operational services in the sector.

As any network-based activity, e-business is subject to critical mass phenomena. Therefore, a high general level of e-business is more likely to stimulate other private and commercial users to become network adopters. In countries, where there is a big difference in diffusion between sectors, the further development of e-readiness will be more difficult than in others. The span between the sector with the lowest and that with the highest indicator value is largest in France, considerably smaller in the UK and in Germany and quite small in Italy. This result is, again, mainly caused by the high diffusion rates of ICT in Italian retailing firms. The rather low value for France's retailing sector can cause a delay in other industries and in the use of e-commerce in private households, since the sector's business partners cannot conduct e-business with retailing firms.

[13] Unfortunately, it is not possible to verify this statement empirically, because European industry statistics do not allow for comparisons beyond the two-digit level.

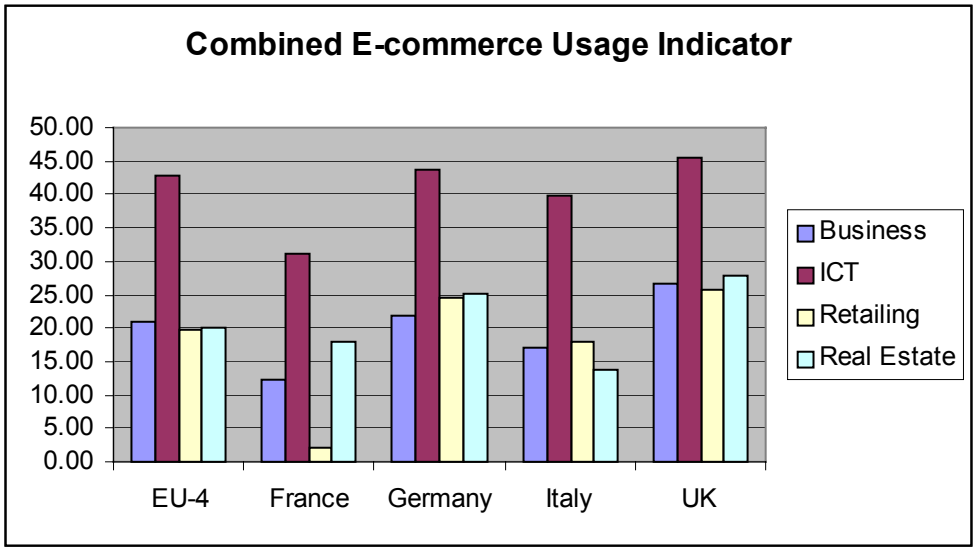
5.2.2 The e-business usage indicators

The indicator consists of two parts, a sub-indicator for e-commerce usage and another one for internal online adoptions; they will be discussed separately, and as a combined e-business usage indicator. All usage indicators more or less confirm the results shown for the readiness indicator. Thus, sectors where network technology is widely used, are also more likely to take the next step and become e-business users. Table 5.2 shows the indicator values for e-commerce .

Table 5.2 E-commerce usage indicator

	Business	ICT	Retailing	Real Estate
EU-4	21.01	42.74	19.80	20.13
France	12.38	31.19	2.15	18.11
Germany	21.98	43.64	24.51	25.22
Italy	17.19	39.82	17.93	13.85
UK	26.79	45.60	25.77	27.80

Figure 5.2



The data presented show that indicators are much lower for e-business usage than for e-business readiness. Obviously, many firms that fulfil the technical preconditions for doing e-business still do not use the related tools. There is much more variance between sectors for E-commerce usage than for e-business readiness. Obviously, it has become standard technology for firms in most service sectors to use basic tools of ICT, but the particularities of service provision lead to a much more differentiated attitude towards e-commerce. Again,

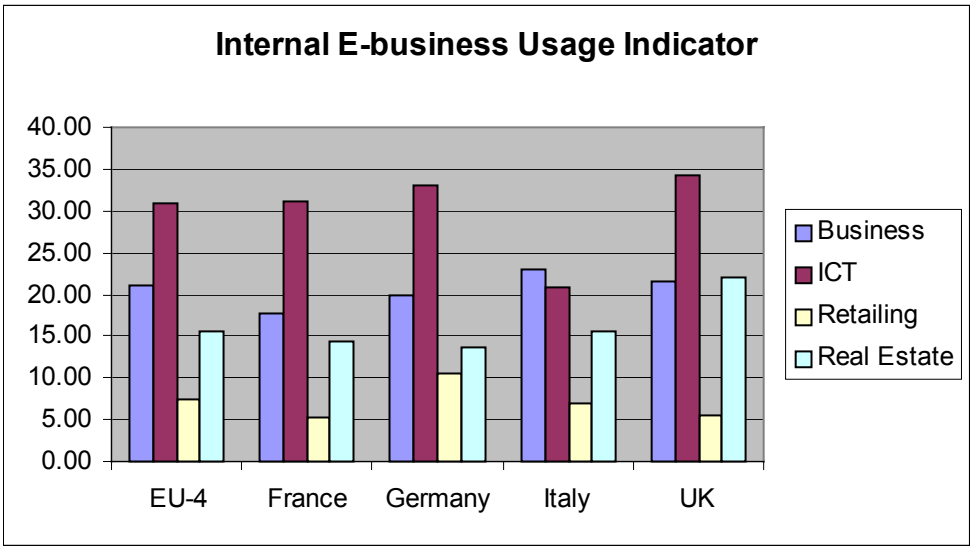
ICT is far ahead of the other sectors, and retailing plays the usual role as a taillight. However, apart from France, where the e-commerce indicator for retailing is particularly low, the retailing sector's indicator is usually closer to that of the other sectors than the e-readiness indicator. ICT firms that possess the necessary equipment use it to a greater extent to do e-commerce than firms in other service sectors, and retailers do this more often than real estate agents and business service providers.

In the definition used here, e-business comprises external online activities as well as the use of online tools in internal communication. Therefore, the indicator for e-commerce presented above has to be complemented by an indicator that covers internal online activities. The results for this *internal e-business usage indicator* are given in Table 5.3 and Figure 5.3.

Table 5.3 Internal e-business usage indicator

	Business	ICT	Retailing	Real Estate
EU-4	21.02	30.85	7.31	15.63
France	17.80	31.07	5.31	14.36
Germany	19.91	33.04	10.49	13.58
Italy	22.89	20.84	6.90	15.60
UK	21.61	34.32	5.44	21.93

Figure 5.3



In all countries besides Italy, the leading role of the ICT sector is evident, and the distance between the retailing sector and other service sectors is more pronounced than for other indicators. This is a plausible result, since there is not much scope for sharing

documents or travel reimbursement in traditional retailing shops. This situation might change with the increasing integration of shops into larger retailing chains or franchising systems. Business services are ahead of real estate firms. Again, this seems to be linked to the nature of the activity: the joint production of documents and a strong emphasis on human resource management are key drivers in the business services sector. The exception of the UK, where real estate reaches very high indicator values for internal online functions, can be explained by the fact that the average number of employees per firm is much higher in this country than in Germany and France (see E-biz Market Watch, Sector report No. 14). Hence, there is more need for electronic co-ordination of activities than in countries with smaller firm sizes in the sector.

The UK and Germany are the countries with the highest diffusion of internal e-business features; the UK shows a strong lead in real estate and is slightly ahead in business service and ICT. Germany plays a leading role in retailing. Only in business services, Italy shows a more advanced diffusion than other countries. One explanation for this could be that value added per employee is relatively high in Italian business service firms (compared with the UK and France). This hints at more complex firm structures which allow to realise economies of scale and favours the introduction of internal online co-ordination.

A look at he composition of the indicator shows that sharing documents is by far the most popular adoption, followed at some distance by e-learning. Tracking working hours is still quite common, whereas human resource management is less often organised online, and travel reimbursements are rarely managed in e-business systems.

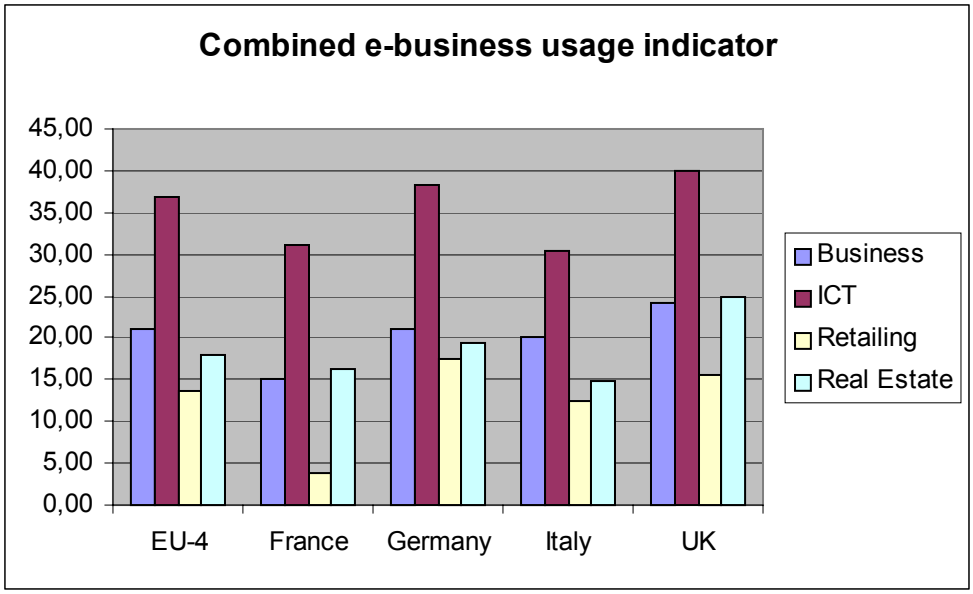
There are no big differences between countries with respect to sharing documents and to human resource management, however, German service firms clearly show a higher use of e-business for tracking working hours and for travel reimbursements. The UK is strong in the adoption of e-learning in all service sectors.

If the two sub-indicators are taken together, the ranking of service sectors becomes more evident: ICT services are the most intensive adopters, followed by business services; real estate comes third, and retailing firms are the least advanced users. (see Table 5.4 and Figure 5.4).

Table 5.4 A combined e-business usage indicator

	Business	ICT	Retailing	Real Estate
EU-4	21.02	36.80	13.56	17.88
France	15.09	31.13	3.73	16.24
Germany	20.95	38.34	17.50	19.40
Italy	20.04	30.33	12.42	14.73
UK	24.20	39.96	15.61	24.87

Figure 5.4



It clearly emerges from this picture that UK and German firms are ahead of their competitors in other countries; their indicator values range above the EU-4 averages for all sectors. The UK is ahead in three sectors, only in retailing German firms are more intensive users than enterprises in England. French firms show lower indicators than Italian firms in the business service sector and in the retailing sector.

5.2.3 Impact indicators

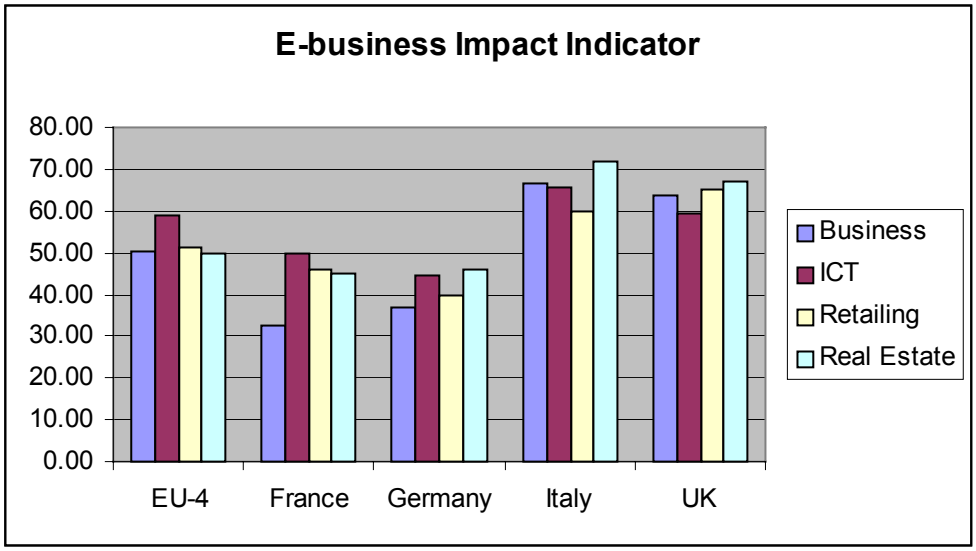
Indicators in this category represent firms that have experienced 'very positive' and 'fairly positive' impacts of e-business. The intention is to document those cases in which a positive experience leads a company to continue and possibly expand e-business activities and which

Table 5.5 E-business Impact Indicator

	Business	ICT	Retailing	Real Estate
EU-4	50.40	58.78	51.43	49.83
France	32.38	49.75	46.10	45.25
Germany	37.13	44.35	39.88	46.05
Italy	66.63	65.73	59.88	71.70
UK	63.58	59.38	65.33	67.28

can cause positive demonstration effects to those firms that are still hesitant. This is assumed to be the case also, if the experience was only 'fairly' positive. Table 5.5 and figure 5.5 show the results.

Figure 5.4



The indicator values are surprisingly high, i.e., firms have mostly perceived a positive impact of their e-business activities. Differences between sectors are much less pronounced than for other indicators.

Italy stands out with high indicators in all sectors, hence there seems to be an overall positive assessment of e-business experiences. However, it has to be borne in mind that for some sectors these results are based on a small number of cases (n=19 for real estate services) and should, thus, be taken as a tendency, rather than as solid findings. Firms in Germany and France have been rather subdued in their assessment of impacts, whereas British firms are

almost as enthusiastic as their Italian counterparts. Interestingly, we do not find the usual ranking of service sectors. ICT firms have perceived e-business experiences more often as positive when considering the four countries together, however, in individual countries, the picture is more diverse. In Germany, Italy and the UK real estate firms stated a positive experience more often than ICT firms. Thus, advanced diffusion of e-business does not mean that firms are also more satisfied with the impact of electronic trading on performance indicators. Many satisfied users, on the other hand, do not seem to push diffusion significantly. Retailing which shows below average values for readiness and usage indicators, ranks above business services with respect to the impact indicator. The absence of a link between high diffusion rates and positive impacts is also visible in the comparison between Germany and France. In Germany, e-business usage indicators, and especially the e-commerce sub-indicators are higher than in the corresponding sectors in France, but there is almost no difference in perceived impacts.

6 Summing up sector and country results

6.1 Sector differences

The indicator system has revealed a hierarchy among sectors which confirms the categorisation given in chapter 2. Services that are based on information technology and would not exist without it, such as ICT services, are also most advanced in the adoption of e-business. Sectors in which information is an important component of inputs and output, use e-business intensively in the business procedures. Here, business services show slightly higher indicator values than real estate services (with the exception of the sub-indicator for E-commerce). Obviously, this is due to the fact that the processing of information runs through all phases of the business services value chain, whereas it is only essential in certain parts of the value chain in real estate services. However, the difference is not as marked as that between these two sectors and the ICT sector. As mentioned before, the business service sector is quite heterogeneous, and the business models in some sub-sectors are not as easily transferable into electronic networks as in others. As expected, retailing as a sector with a relatively low information content in service provision, also shows a poor diffusion of e-business.

These results can be contrasted with the statements of firm representatives. The survey questionnaire asks about barriers for selling goods online and respondents can tick the pre-

formulated answer ‘services do not lend themselves for selling online’. Table 6.1 gives the percentage of interview partners that ‘completely agree’ with this statement.

Surprisingly, the firms in the sector with the lowest e-business activity, retailing, less often hold that their business does not lend itself to selling online than others. Hence, other factors, like a predominance of small enterprises or organisational difficulties must be responsible for the hesitation. In these cases it is likely that firms will start to engage in e-business with some delay.

Table 6.1 ‘Services do not lend themselves to selling online’: per cent of responding firms

	Business	ICT	Retailing	Real Estate
EU-4	51.3	45.9	38.5	56.0
France	55.9	54.9	39.3	49.2
Germany	65.0	45.6	35.1	61.7
Italy	42.6	37.2	40.9	53.1
UK	46.7	48.2	36.6	60.0

The other astonishing finding is that firms in the same sector, but in different countries show quite different opinions concerning this barrier. The variation is particularly evident in business services, where less than 43% of the Italian and 65% of the German respondents consider this barrier as relevant. Again, this can be the result of variation in the composition of the sector or be due to differences in the business climate in the single countries. It can also be related to differences in cultural attitudes towards doing business electronically. Differences between countries are less pronounced, where scepticism in the sector is generally low. In countries where the level of e-business usage is generally not very high, firms lack demonstration effects and, thus, find it more difficult to envisage scenarios of useful e-business models. With a more widespread use, these demonstration effects can convince non-users that indeed there are meaningful adoptions in their business.

It is interesting to see that service sectors that show a high ‘e-readiness’ also normally have high usage indicator values. The two sets of indicators can be combined to form an exploitation factor. Since all indicators are normalised to produce a maximum value of 100, calculating the share of usage indicator values in readiness indicator values generates an indicator for the exploitation of existing equipment for e-business, or an *exploitation factor.* A

factor of 1 would mean that all firms that possess the technical preconditions also use them to engage in e-business.

Table 6.2 E-business exploitation factors

	Business services	ICT services	Retailing	Real estate services
EU-4	0.56	0.83	0.47	0.5
France	0.38	0.69	0.16	0.5
Gemany	0.57	0.86	0.66	0.52
Italy	0.50	0.73	0.37	0.37
UK	0.72	0.89	0.62	0.70

Source: E-biz Market Watch. Own calculations.

The figures demonstrate the differences in exploitation factors between countries and sectors. The most intensive use of the existing infrastructures is made in ICT services, while in retailing, the equipment might exist, but only in Germany it is used to engage in e-business to a significant extent. The endowment with infrastructure in the UK was rather poor, measured in terms oft the infrastructure indicator, however, exploitation factors lie far above the European average. French and Italian firms, in contrast, possess the necessary tools and connections, but do not use them for e-business in the same extent as the average of European firms.

6.2 Country differences

Indicator values show a wide rang of e-business activity in different European countries. However, in general, sector specificity has a stronger influence than country specificity. However, there are some interesting country differences. E-readiness indicators show Italy ahead, followed by Germany, the France and the UK, if all four sectors are considered together. French firms rank highest in business and ICT services, and Italy in retailing and real estate services. Usage indicators show a completely different picture: Exploitation factors put the UK and Germany clearly above the European average, and Italy and France follow at some distance, and well below the average. The UK, thus, uses a relatively poor endowment with network infrastructures and connections to generate a high level of e-business activities. This holds for all sectors, (except retailing). Germany comes

second with respect to usage indicators. In France low e-readiness is resulting in low e-business levels, and Italian firms do not use (sometimes remarkable) infrastructures to do e-business at the same level as firms in other countries. Hence, whereas Italy has higher e-readiness indicators than the other counties, it comes only third with respect to e-commerce and overall e-business usage. The e-readiness indicator in Italian real estate services, for example, is substantially higher than the European average, but it corresponds with a usage indicator that is lower than in any other country in this sector. German service providers rank second for all indicators, i.e., there is no significant discrepancy between infrastructure endowment and its use for e-business.

In an overall assessment of the advancement of use of internet related technologies and the realisation of e-business schemes, English service firms rank higher than their German counterparts. Both are well ahead of firms in the other two reference countries. However, German firms show a higher level of e-readiness, i.e., they could catch-up with respect to usage in the near future. Hence, a German service gap can only be observed in comparison with the UK, and here only for usage and impact indicators.

However, differences in e-business diffusion in service sectors can be a consequence of an overall reluctance in a national economy to engage in electronic transactions. In this case, the same or similar configurations would be found with respect to manufacturing industries as well. Therefore, indicators for four manufacturing sectors, chemicals, electronics, machine construction and transport equipment, have been calculated. These indicators can be seen as giving an indication for e-business in the manufacturing sector as a whole.

Table 6.3 E-business indicators in manufacturing and service industries

	E-readiness		E-usage		Impact	
	manufacturing	services	manufacturing	services	manufacturing	services
EU-4	73.82	73.06	15.50	22.31	50.08	52.61
France	66.90	70.57	13.18	16.55	47.44	43.37
Germany	74.95	72.84	19.90	24.05	47.75	41.85
Italy	82.28	77.36	12.94	19.38	56.12	65.99
UK	68.12	69.90	15.80	26.16	50.98	63.89
Source: E-biz market watch 2002.						

In Germany and Italy readiness indicators are higher in manufacturing than in services, in the UK and in France the contrary is the case. This means that German service firms lag behind the manufacturing sector. It can therefore be concluded that the dominance of the German manufacturing sector is also visible in a more advanced e-readiness. However, rankings among countries are not dramatically affected by this phenomenon. France and the UK change places, whereas Italy and Germany occupy first and second positions in both groups.

Usage indicators show more pronounced differences: here services lie way ahead of manufacturing in all countries (hence, exploitation factors tend to be much lower in manufacturing than in service firms). This holds for the two sub-indicators as well, however, in e-commerce the differences are much more pronounced than for internal e-business variables. In the UK the wider diffusion of e-business usage in services with respect to manufacturing is most striking, while France and Germany show comparatively modest differences. In terms of country ranking, this puts the UK far ahead of the other countries in the service sector, Germany remains in second place. The positions are exactly opposite in manufacturing. Because of the relatively high usage indicator in German manufacturing, in Germany the difference between services and manufacturing remains further below the European average than for the readiness indicator, although in absolute terms, the German service sector usage indicator is considerably higher than the EU-4 average. This confirms the argument that service sector weakness often is not a weakness per se but mainly becomes evident in comparison with manufacturing, if the manufacturing sector is particularly strong.

For the impact indicator the low values in Germany's service sector correspond to low values in manufacturing. However, again, the difference is more pronounced here than in other countries, resulting in a particularly marked superiority of the manufacturing over the service indicator.

The particular configuration of the German service sector and its particular position in the economy are also affecting e-business adoption in this sector. However, this should not lead to hasty judgements about the superiority of one configuration over the other. The relationship and interaction between the two sectors have given rise to a complex debate in which the results presented here cannot be more than a small pebble.

For the analysis as a whole, it can be concluded that e-readiness is a necessary condition to do e-business, but there is no automatism that leads from good infrastructures to e-business activity.

However, German firms see their e-business experience by far less positive than firms in other countries. This might lead to a slowing down of future expansion rates. The positive experience of Italian e-business adopters, on the other hand, gives rise to a more optimistic attitude and can induce other firms to engage in electronic business models.

References

Barras, R. (1986): New Technology and the New Services - Towards an innovation strategy for Europe, in: Futures, p. 748-772.

Baumol. William J. (1986): Information Technology and the SERVICE Sector. A Feedback Process?. In: Services in Transition, ed. by Gerald Faulhaber, Eli Noam, and Roberta Tasley, Cambridge (Mass.) Ballinger, pp. 183-194.

Berlecon Research (2002a): Business Services. Impact Study No. 15/1. http://www.ebusiness-watch.org/marketwatch/resources/resources.htm

Berlecon Research (2002b): ICT Services. Impact Study 6/1. http://www.ebusiness-watch.org/marketwatch/resources/resources.htm

Bullinger, H.-J. (1997): Dienstleistungen fuer das 21. Jahrhundert - Trends, Visionen und Perspektiven, in: Dienstleistungen fuer das 21. Jahrhundert, ed. by H.-J. Bullinger, Stuttgart.

Cornetz, W. / *Schäfer,* H. (1999): Dienstleistungsdefizit in der Bundesrepublik Deutschland? in: W. Cornetz (1999) Chancen durch Dienstleistungen, Wiesbaden.

Czarnitzki, Dirk / *Spielkamp*, Alfred (2003): Busness Services in Germany: Bridges for Innovation. In The Service Industries Journal, Vol. 23, No.2 (March 2003), pp.1-30.

Databank Consulting (2002): Retail. Impact Study 12/1. http://www.ebusiness-watch.org/marketwatch/resources/resources.htm

DIW (1998): Das Dienstleistungs-Puzzle - Ein aktualisierter deutsch-amerikanischer Vergleich. Wochenbericht des DIW, 35/98, pp.625-629, Bearbeiter: Haisken-DeNew, J. et al.

Ducatel, Ken (2000): Information Technoloiges in Non-Knowledge Services. In Innovation Systems in the Service economy – Measurement and Case Study Analysis, ed. by Stanley Metcalfe and Ian Miles, Boston/Dordrecht/London (Kluwer).

E-biz Market Watch Group (2002): Sector Reports. http://www.ebusiness-watch.org/marketwatch/ . Last accessed 30 April, 2003.

E-biz Market Watch Group (2003): The European e-Business Report. Ed. by European Commission. Brussels.

empirica (2002): Real Estate. Impact Study 14/1. http://www.ebusiness-watch.org/marketwatch/resources/resources.htm

Freeman, Richard / *Schettkat*, Ronald (1999): Zwischen Fastfood and Excellence. Die Beschäftigungslücke in Deutschland im Vergleich zu den USA. In: Hamburger Jahrbuch für Wirtschafts- und Gesellschaftspolitik, vol. 44 (1999), pp. 95 - 113.

Hepworth, Mark / *Ryan,* John (2000): Small Firms in Europe's Developing information Society. In The Information Society in Europe, ed. by Ken *Ducatel,* Juliet *Webster,* and Werner *Herrmann.* Lanham, Boulder, New York, Oxford (Rowman and Littlefield), pp.73-96.

Katz, M. L. and *Shapiro*, C. (1985): *Network Externalities, Competition and Compatibility*, in: American Economic Review, vol.75, no.3, 1985, p.424-440.

Klein, Stefan / *Totz*, Carsten (2003): Prosumers as service configurators – vision, status and future requirements. In: E-Life after the dot.com Bust, ed. by Harry Bouwman, Charles Steinfield and Brigitte Preissl, Physica/Springer, forthcoming.

Licht, Georg and *Moch*, Dietmar (1997): Innovation and Information Technology in Services, Zentrum für Europäische Wirtschaftsforschung, May (mimeo.).

Margherio, Lynn (1998): The Emerging Digital Economy, U.S. Department of Commerce, Washington D. C., abrufbar unter www.ecommerce.gov .

Miles, Ian (1993): Services in the New Industrial Economy, in: Futures, pp.653-672.

Miles, I./*Kastrinos*, N./*Flanagan*, K./*Bilderbeek*, R./*denHertog*, P./*Huntink*, W./*Bouman*, M. (1994): *Knowledge-Intensive Business Services: Their Roles as Users, Carriers and Sources of Innovation*, PREST december 1994.

Miles, Ian and *Boden,* Mark (2000)*:* Are Services Special? Introduction. In Services and the Knowledge Based Economy, ed. by Mark Boden and Ian Miles, London and New York (Continuum), pp.1-20

Preissl, Brigitte (1995a): Strategic Use of Communication Technology - Diffusion Processes in Networks and Environments, in: Information Economics and Policy, Vol. 7, 1995, p. 75–99.

Preissl, Brigitte (1995b): New Landscapes in the Service Sector - Information and Communication Technologies and Structural Change, Aston Business School Research Paper Series, RP 9513, Dec. 1995.

Preissl, Brigitte (1998a): Analyse comparative de l'informatisation. Proposition pour un indicateur combiné, in: Reseaux - Communication, Technologie, Societè, No. 87 - Dossier: Les Claviers, Jan./Fev. 1998, p.119–136.

Preissl, Brigitte (1998b): Information Technologies in the Service Sector - Monitoring Change at the Industry Level, in: Gary Madden / Stuart Macdonald (eds.): Telecommunications and Socio-Economic Development, London 1998, p. 217–p.230.

Preissl, Brigitte (2000): European Service Sectors, in: Services and the Knowledge Based Economy, ed. by Mark Boden and Ian Miles, London and New York (Continuum), pp.64-85.

Steinfield, C. and *Whitten*, P. (1999): Community level Socio - Economic Impacts of Electronic Commerce. *JCMC5 (2*) December 1999, http://www.ascusc.org/jcmc/vol5/issue2/steinfield.htm .